

What is claimed is:

1           1.     A method for processing digital images received in the form of  
2     compressed video streams comprising the step of (a) determining a region intensity  
3     histogram (RIH) based on information on motion compensation of inter frames.

1           2.     The digital video processing method according to claim 1, before the  
2     step (a), further comprising the steps of:  
3           (p-a) receiving video streams;  
4           (p-b) grouping the video streams into a plurality of groups using a  
5     predetermined algorithm;  
6           (p-c) selecting a group to be processed,  
7           wherein in the step (a), the RIH of the selected group is determined based on  
8     information on motion compensation of inter frames.

1           3.     A method for processing digital images received in the form of  
2     compressed video streams comprising the step of:  
3           (a) selecting an inter frame from the video streams;  
4           (b) with respect to the selected inter frame, calculating the ratio of the number  
5     of blocks whose motion compensation values are zero to the total number of  
6     macroblocks;  
7           (c) quantizing the ratio into  $i$  levels, where  $i$  is a predetermined positive  
8     number;  
9           (d) checking whether the processed inter frame is the last one;  
10          (e) if it is determined in the step (d) that the processed inter frame is not the  
11     last one, selecting the next inter frame and performing the steps (b) through (d);  
12          (f) if it is determined in the step (d) that the processed inter frame is the last  
13     one, calculating the ratio of the number of inter frames in the  $i$ th level to the total  
14     number of inter frames in a given region; and  
15          (g) determining the ratio obtained in the step (f) as predetermined histogram  
16     information.

1           4.     The digital video processing method according to claim 3, further  
2 comprising the steps of:  
3           (p-a) receiving video streams;  
4           (p-b) grouping the video streams into a plurality of groups using a  
5 predetermined algorithm;  
6           (p-c) selecting a group to be processed,  
7 wherein in the step (a), an inter frame is selected from the video stream group  
8 selected in the step (p-c).

1           5.     The digital video processing method according to claim 4, after the  
2 step (g), further comprising the steps of:  
3           (h) checking whether the selected group is the last one;  
4           (i) if it is determined in the step (h) that the selected group is not the last one,  
5 selecting the next group; and  
6           (j) performing the steps (a) through (h) with respect to the next group selected  
7 in the step (i).

1           6.     The digital video processing method according to claim 4, wherein the  
2 predetermined algorithm is a scene cut detection algorithm.

1           7.     The digital video processing method according to claim 5, wherein the  
2 predetermined algorithm is a scene cut detection algorithm.

1           8.     The digital video processing method according to claim 4, wherein the  
2 video streams are moving picture expert group (MPEG)-7 video streams.

1           9.     The digital video processing method according to claim 5, wherein the  
2 video streams are moving picture expert group (MPEG)-7 video streams.

1           10.    The digital video processing method according to claim 6, wherein the  
2 video streams are moving picture expert group (MPEG)-7 video streams.

1           11.    The digital video processing method according to claim 7, wherein the  
2 video streams are moving picture expert group (MPEG)-7 video streams.

1           12.    The digital video processing method according to claim 3, wherein the  
2 predetermined histogram information is defined by a region intensity histogram (RIH)  
3 which indicates the intensity of a given video scene region.

1           13.    The digital video processing method according to claim 4, wherein the  
2 predetermined histogram information is defined by a region intensity histogram (RIH)  
3 which indicates the intensity of a given video scene region.

1           14.    The digital video processing method according to claim 5, wherein the  
2 predetermined histogram information is defined by a region intensity histogram (RIH)  
3 which indicates the intensity of a given video scene region.

1           15.    The digital video processing method according to claim 6, wherein the  
2 predetermined histogram information is defined by a region intensity histogram (RIH)  
3 which indicates the intensity of a given video scene region.

1           16.    The digital video processing method according to claim 7, wherein the  
2 predetermined histogram information is defined by a region intensity histogram (RIH)  
3 which indicates the intensity of a given video scene region.

1           17.    The digital video processing method according to claim 8, wherein the  
2 predetermined histogram information is defined by a region intensity histogram (RIH)  
3 which indicates the intensity of a given video scene region.

1           18.    The digital video processing method according to claim 9, wherein the  
2 predetermined histogram information is defined by a region intensity histogram (RIH)  
3 which indicates the intensity of a given video scene region.

1           19.     The digital video processing method according to claim 10, wherein the  
2     predetermined histogram information is defined by a region intensity histogram (RIH)  
3     which indicates the intensity of a given video scene region.

1           20.     The digital video processing method according to claim 11, wherein the  
2     predetermined histogram information is defined by a region intensity histogram (RIH)  
3     which indicates the intensity of a given video scene region.

1           21.     A digital video processing method comprising the step of defining the  
2     distribution of blocks whose motion compensation values are zero as motion activity,  
3     with respect to inter frames.

1           22.     A computer readable medium having program codes executable by a  
2     computer to perform a digital video processing method comprising the steps of:

3           (a) selecting an inter frame from the video streams;

4           (b) with respect to the selected inter frame, calculating the ratio of the number  
5     of blocks whose motion compensation values are zero to the total number of  
6     macroblocks;

7           (c) quantizing the ratio into  $i$  levels, where  $i$  is a predetermined positive  
8     number;

9           (d) checking whether the processed inter frame is the last one;

10          (e) if it is determined in the step (d) that the processed inter frame is not the  
11     last one, selecting the next inter frame and performing the steps (b) through (d);

12          (f) if it is determined in the step (d) that the processed inter frame is the last  
13     one, calculating the ratio of the number of inter frames in the  $i$ th level to the total  
14     number of inter frames in a given region; and

15          (g) determining the ratio obtained in the step (f) as predetermined histogram  
16     information.

1           23.     The computer readable medium according to claim 22, wherein the  
2     digital video processing method further comprises:

3           (p-a) receiving video streams;

4 (p-b) grouping the video streams into a plurality of groups using a  
5 predetermined algorithm; and  
6 (p-c) selecting a group to be processed, and wherein in the step (a), an inter  
7 frame is selected from the video stream group selected in the step (p-c).

1 24. The computer readable medium according to claim 23, wherein after  
2 the step (g), the digital video processing method further comprises the steps of:  
3 (h) checking whether the selected group is the last one;  
4 (i) if it is determined in the step (h) that the selected group is not the last one,  
5 selecting the next group; and  
6 (j) performing the steps (a) through (h) with respect to the next group selected  
7 in the step (i).

1 25. The computer readable medium according to claim 23, wherein the  
2 predetermined algorithm is a scene cut detection algorithm.

1 26. The computer readable medium according to claim 24, wherein the  
2 predetermined algorithm is a scene cut detection algorithm.

1 27. The computer readable medium according to claim 22, wherein the  
2 video streams are MPEG-2 video streams.

1 28. The computer readable medium according to claim 23, wherein the  
2 video streams are MPEG-2 video streams.

1 29. The computer readable medium according to claim 24, wherein the  
2 video streams are MPEG-2 video streams.

1 30. The computer readable medium according to claim 25, wherein the  
2 video streams are MPEG-2 video streams.

1           31.    The computer readable medium according to claim 26, wherein the  
2 video streams are MPEG-2 video streams.

1           32.    The computer readable medium according to claim 22, wherein the  
2 predetermined histogram information is defined by a region intensity histogram (RIH)  
3 which indicates the intensity of a given video scene region.

1           33.    A digital video processing apparatus comprising:  
2           grouping means for grouping video streams using a predetermined algorithm,  
3 selecting a group to be processed, and selecting and outputting each inter frame  
4 from the selected group in sequence;  
5           ratio calculating means for calculating the ratio of the number of blocks whose  
6 motion compensation values are zero to the total number of macroblocks, with  
7 respect to the selected inter frame;  
8           quantizing means for quantizing the ratio into  $i$  levels, where  $i$  is a  
9 predetermined positive number, and outputting level indication signals which indicate  
10 the respective levels; and  
11          region intensity histogram (RIH) calculating means for calculating the ratio of  
12 the number of inter frames in the  $i$ th level to the total number of inter frames in a  
13 region, and outputting the calculation result as RIH information.

1           34.    The digital video processing apparatus according to claim 33, wherein  
2 the predetermined histogram information is defined by a region intensity histogram  
3 (RIH) which indicates the intensity of a given video scene region.

1           35.    The digital video processing apparatus according to claim 33, further  
2 comprising RIH information storage means for receiving the RIH information and  
3 storing the same.

1           36.    The digital video processing apparatus according to claim 34, further  
2 comprising RIH information storage means for receiving the RIH information and  
3 storing the same.

1           37.    The digital video processing apparatus according to claims 35, wherein  
2 the RIH information storage means receives video stream data, interleaves the RIH  
3 information into the video stream data and outputs RIH information interleaved video  
4 streams.

1           38.    The digital video processing apparatus according to claims 36, wherein  
2 the RIH information storage means receives video stream data, interleaves the RIH  
3 information into the video stream data and outputs RIH information interleaved video  
4 streams.

1           39.    A digital video analyzing method comprising the step of calculating the  
2 difference between  $RIH_1$  and  $RIH_2$ , which is denoted by *Distance* ( $RIH_1$ ,  $RIH_2$ ), as  
3 represented by the following Expression:

$$Distance(RIH_1, RIH_2) = (RIH_1 - RIH_2)^T M^{-1}(RIH_1, RIH_2)$$

5 wherein, of two video streams in a given video scene, RIH information of the first  
6 video stream is  $RIH_1$ , RIH information of the second video stream is  $RIH_2$ , and  $M$  is a  
7 covariance matrix.

1           40.    The digital video analyzing method according to claim 39, further  
2 comprising the step of determining the calculated difference by the difference in  
3 intensity between two video streams.

1           41.    A method for searching for a desired digital video scene in compressed  
2 video streams comprising the step of:

- 3           (a) receiving video streams;
- 4           (b) grouping the video streams into a plurality of groups using a
- 5           predetermined algorithm;
- 6           (c) selecting a group to be processed;
- 7           (d) determining a region intensity histogram (RIH) of the selected group
- 8           based on information on motion compensation of inter frames in the selected group;

9 (e) selecting a video scene to be searched;  
10 (f) retrieving RIH information of the selected video scene; and  
11 (g) searching regions having similar RIH information based on the retrieved  
12 RIH information, in each of the processed video streams.

1 42. An apparatus for searching for a desired digital video scene in  
2 compressed video streams comprising:  
3 grouping means for grouping input video streams into a plurality of groups  
4 using a predetermined algorithm;  
5 motion compensation information retrieving means for retrieving information  
6 on motion compensation of inter frames from a selected group and outputting  
7 processed video streams including the information as the RIH information of the  
8 selected group; and  
9 searching means for retrieving RIH information of a selected group to be  
10 searched and searching for regions having similar RIH information based on the  
11 retrieved RIH information.

1 43. A digital video processing apparatus comprising:  
2 a grouping unit for grouping video streams using a predetermined algorithm,  
3 selecting a group to be processed, and selecting and outputting each inter frame  
4 from the selected group in sequence;  
5 a ratio calculating unit for calculating the ratio of the number of blocks whose  
6 motion compensation values are zero to the total number of macroblocks, with  
7 respect to the selected inter frame;  
8 a quantizing unit for quantizing the ratio into  $i$  levels, where  $i$  is a  
9 predetermined positive number, and outputting level indication signals which indicate  
10 the respective levels; and  
11 a region intensity histogram (RIH) calculating unit for calculating the ratio of  
12 the number of inter frames in the  $i$ th level to the total number of inter frames in a  
13 region, and outputting the calculation result as RIH information.



1           44.    The digital video processing apparatus according to claim 43, wherein  
2   the predetermined histogram information is defined by a region intensity histogram  
3   (RIH) which indicates the intensity of a given video scene region.

1           45.    The digital video processing apparatus according to claim 43, further  
2   comprising a region intensity histogram (RIH) information storage unit for receiving  
3   the RIH information and storing the same.

1           46.    The digital video processing apparatus according to claim 44, further  
2   comprising a region intensity histogram (RIH) information storage unit for receiving  
3   the RIH information and storing the same.

1           47.    The digital video processing apparatus according to claims 43, wherein  
2   the RIH information storage unit receives video stream data, interleaves the RIH  
3   information into the video stream data and outputs RIH information interleaved video  
4   streams.

1           48.    An apparatus for searching for a desired digital video scene in  
2   compressed video streams comprising:  
3        a grouping unit for grouping input video streams into a plurality of groups  
4        using a predetermined algorithm;  
5        a motion compensation information retrieving unit for retrieving information on  
6        motion compensation of inter frames from a selected group and outputting  
7        processed video streams including the information as the RIH information of the  
8        selected group; and  
9        a searching unit for retrieving RIH information of a selected group to be  
10   searched and searching for regions having similar RIH information based on the  
11   retrieved RIH information.